



## PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION.

## Improvements in Distance Pieces for Reinforcing Hollow Sheet Metal Structural Members.

We, NUFFIELD METAL PRODUCTS LIMITED, a Company incorporated under the Laws of Great Britain, of Common Lane, Washwood Heath, Birmingham 8, and Edmund Speed, a British Subject, of the Company's address, do hereby declare the nature of this invention to be as follows :—

Hollow sheet metal structural members are normally reinforced, at the points of attachment of load-carrying members, by means of tubular distance pieces which act as compression members and are welded in place so as to surround bolts or rivets by which the load-carrying members are secured to the structural members. For example, this is the usual practice when attaching load-carrying members, such as door hinges or road spring brackets, to the box-section sheet metal structural members employed in modern motor vehicle construction.

In the mass production of motor vehicle bodies and components, the use of tubular distance pieces for local reinforcements of box-section sheet metal structural members is attended by serious drawbacks. Ordinarily it is not possible to attach these distance pieces to the structural members by means of spot-welding, and gas welding has to be employed instead. Apart from taking longer to carry out than spot-welding, and therefore being more costly, the gas welding operation impedes the smooth flow of the vehicle assembly lines and also results in distortion of the neighbouring sheet metal.

The aim of this invention is to obviate the disadvantages associated with the use of tubular distance pieces, whilst retaining all the advantages. To this end, according to the present invention, the reinforcement of a box-section or other hollow sheet metal structural member is effected by means of a distance piece which, instead of being tubular, is of open-ended box-like form and is provided at one end with at least one flange-like attachment lug which is spot-welded or rivetted to an internal face of one of the components of the structural

member before the latter is assembled. The attachment lug or lugs may either be formed integrally with the body of the distance piece, or may be made separately and united to it by spot-welding or any other convenient method. Also, the distance piece may be provided with means by which the bolts or rivets for securing the load-carrying member to the structural member are guided and supported whilst being inserted in place. Such guiding and supporting means for the bolts or rivets may conveniently be formed either wholly or in part by a member or members disposed inside the box-like distance piece. For example, a substantially rectangular sheet metal frame having recessed corners may be disposed inside the distance piece so that quasi-tubular guides for the bolts or rivets are formed by the oppositely-curved, juxtaposed corners of these two components.

In one example of construction in accordance with this invention the distance piece is fabricated from a strip of sheet metal which is bent into the form of an open-ended rectangular frame with rounded corners. The ends of the formed strip are united by a spot-welded lap joint. The box-like distance piece thus obtained is provided with a pair of flange-like attachment lugs located respectively at opposite sides of one of its open ends. These lugs are incorporated as integral parts of the blank from which the distance piece is fabricated, and they are bent outwardly so as to present flat abutment faces co-planar with the corresponding open end of the distance piece.

The attachment lugs are spot-welded to an internal face of one of the components of the box-section structural member, which is to be reinforced, before this member is assembled. The member in question may, for example, be a door pillar of a motor vehicle, and, after it has been assembled with the requisite distance pieces already attached in place the door hinges can be

bolted to it. The arrangement is such that the securing bolts of the door hinges or other load-carrying members extend through the open ends of the associated distance piece at its corners, each bolt being closely embraced over at least one quarter of its circumference by the corresponding rounded corner of the distance piece.

Another example of construction has a substantially rectangular frame arranged inside the distance piece. This frame is made by bending a strip of sheet metal of the same width as that used for the body of the distance piece, so that the sides of the frame fit snugly within the distance piece. The corners of the frame are recessed so that, in conjunction with the oppositely curved corners of the distance piece proper, quasi-tubular guides are formed for the securing bolts. The adjacent ends of the strip from which the inner frame is formed, and the opposite side of this frame, are spot-welded to the respective sides of the distance piece. In this form of construction, instead of having a lap joint between the ends of the strip from which the body of the distance piece is formed, these ends are individually spot-welded to the associated side of the inner frame.

A modification of the example of construction last described has the inner frame in the form of a plain rectangle without recessed corners, and this frame extends completely between only one pair of opposite sides of the distance piece, the remaining two sides of the frame each being spaced from the adjacent side of the distance piece to leave a gap of sufficient width to accommodate the securing bolts. The distance piece and its inner frame are united by spot-welding; and the attachment lugs, which in this case are separate angle-pieces, are spot-welded to the distance piece.

The body of the distance piece in the case of any of the examples described above may, if desired, be formed in two halves from a pair of channel-section members with outwardly directed flanges which are brought together and united by spot-welding. A further example of construction, in which the distance piece is fabricated in that way, incorporates an inner frame composed of a pair of sheet metal pressings of identical shape disposed back to back so that each

represents the mirror image of the other. Each of these pressings has a central recess of approximately semi-cylindrical shape which extends between the open ends of the distance piece, so that the respective central recesses combine to form a substantially tubular guide for a centrally placed securing bolt. Along opposite sides of each pressing there is a U-shaped recess which extends parallel to the central recess and is of elongated shape in cross-section. These lateral recesses of the two pressings combine to form what are, in effect, slots extending between a pair of opposite sides of the distance piece. Each of these slots serves as a guide for two securing bolts which lie respectively at opposite extremities of the slot. The distance piece is provided with a pair of attachment lugs arranged as in the other examples previously described. The pressings constituting the inner frame, may, if desired, be spot-welded to the body of the distance piece or they may be left unattached.

In addition to the advantages already pointed out, distance pieces constructed and arranged in accordance with this invention possess the further advantage that the attachment of the load-carrying member to the box-section structural member braces the latter by stabilising a pair of its opposite walls over a substantial area when the securing bolts or rivets are inserted and tightened.

It will be appreciated that the attachment lug or lugs of the distance piece need only be of sufficient area to hold the distance piece in place during subsequent welding or rivetting operations on the structural member, since, when the securing bolts or rivets are assembled in position, the whole arrangement is self-clamping. Further, the distance piece may be provided with only one attachment lug, if desired, instead of two as in the particular examples described, or it may have four of these lugs provided respectively one on each side of one of the open ends of the distance piece.

Dated this 28th day of March, 1947.

For the Applicants,  
A. H. STEED,  
Chartered Patent Agent.

#### COMPLETE SPECIFICATION.

#### Improvements in Distance Pieces for Reinforcing Hollow Sheet Metal Structural Members.

We, NUFFIELD METAL PRODUCTS LIMITED,  
a Company incorporated under the Laws of  
Great Britain, of Common Lane, Washwood

Heath, Birmingham 8, and EDMUND SPEED,  
a British Subject, of the Company's address,  
do hereby declare the nature of this invention

and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

5 Hollow sheet metal structural members are normally reinforced, at the points of attachment of load-carrying members, by means of tubular distance pieces which act as compression members and are welded in  
10 place so as to surround bolts or rivets by which the load-carrying members are secured to the structural members. For example, this is the usual practice when attaching load-carrying members, such as door hinges  
15 or road spring brackets, to the box-section sheet metal structural members employed in modern motor vehicle construction.

In the mass production of motor vehicle bodies and components, the use of tubular distance pieces for local reinforcement of box-section sheet metal structural members is attended by serious drawbacks. Ordinarily it is not possible to attach these distance pieces to the structural members by means of spot-welding, and gas welding has to be employed instead. Apart from taking longer to carry out than spot-welding, and therefore being more costly, the gas welding operation impedes the smooth flow of the vehicle  
20 assembly lines and also results in distortion of the neighbouring sheet metal.

The aim of this invention is to obviate the disadvantages associated with the use of tubular distance pieces, whilst retaining all the advantages. To this end, according to the present invention, the reinforcement of a box-section or other hollow sheet metal structural member, assembled from component parts, is effected by means of a distance piece which, instead of being tubular, is of open-ended box-like form and is provided at one end with at least one flange-like attachment lug which is spot-welded or rivetted to an internal face of one of the component parts of the structural member before the latter is assembled. The attachment lug or lugs may either be formed integrally with the body of the distance piece, or may be made separately and united to it by spot-welding or any other convenient method. Also, the distance piece may be provided with means by which the bolts or rivets for securing the load-carrying member to the structural member are guided and supported whilst being inserted in place. Such guiding and supporting means for the bolts or rivets may conveniently be formed either wholly or in part by a member or members disposed inside the box-like distance piece. For example, a substantially rectangular sheet metal frame having recessed corners may be disposed inside the distance piece so that quasi-tubular guides for the bolts or rivets  
65 are formed by the oppositely-curved, juxtaposed corners of these two components.

posed corners of these two components.

The invention will now be described by way of example with reference to the accompanying drawings, in which :—

Figure 1 is a fragmentary perspective view illustrating the reinforcement of a box-section sheet metal structural member by a distance piece in accordance with the invention, the structural member being shown broken away to reveal the distance piece ;

Figure 2 is a plan of the arrangement shown in Figure 1 ; and

Figures 3 to 5 are perspective views of three other constructional forms of distance pieces for use in carrying out the invention.

Referring now to Figures 1 and 2, the distance piece 1 is fabricated from a strip of sheet metal which is bent into the form of an open-ended rectangular frame with rounded corners. The ends of the formed strip are united by a spot-welded lap joint 2. The box-like distance piece thus obtained is provided with a pair of flange-like attachment lugs 3 located respectively at opposite sides of one of its open ends. These lugs are incorporated as integral parts of the blank from which the distance piece is fabricated, and they are bent outwardly so as to present flat abutment faces coplanar with the corresponding open end of the distance piece.

The attachment lugs 3 are spot-welded to an internal face 4 of one of the component parts of the box-section structural member 5, which is to be reinforced, before this member is assembled. The member in question may, for example, be a door pillar of a motor vehicle, and, after it has been assembled with the requisite distance pieces already attached in place, the door hinges, one of which is indicated at 6, can be bolted to it. The arrangement is such that the securing bolts 7 of the door hinges or other load-carrying members extend through the open ends of the associated distance piece at its corners, each bolt being closely embraced over at least one quarter of its circumference by the corresponding rounded corner of the distance piece.

The distance piece shown in Figure 3 has a substantially rectangular frame 8 arranged inside it. This frame is made by bending a strip of sheet metal of the same width as that used for the body of the distance piece, so that the sides of the frame fit snugly within the distance piece. The corners of the frame 8 are recessed so that, in conjunction with the oppositely-curved corners of the distance piece proper, quasi-tubular guides 9 are formed for the securing bolts. The adjacent ends of the strip from which the inner frame is formed, and the opposite side of this frame, are spot-welded at 10 and 11 to the respective sides

of the distance piece. In this form of construction, instead of having a lap joint between the ends of the strip from which the body of the distance piece is formed, these ends are individually spot-welded at 11 to the associated side of the inner frame. Integral attachment lugs 12 are provided, corresponding to the lugs 3 in Figure 1.

Figure 4 represents a modification of the example of construction shown in Figure 3, in which there is an inner frame 13 in the form of a plain rectangle without recessed corners, and this frame extends completely between only one pair of opposite sides of the distance piece, the remaining two sides of the frame each being spaced from the adjacent side of the distance piece to leave a gap 14 of sufficient width to accommodate the securing bolts. The distance piece and its inner frame 13 are united by spot-welding at 15 and 16; and the attachment lugs, which in this case are separate angle-pieces 17, are spot-welded to the distance piece.

The body of the distance piece in the case of any of the examples described above may, if desired, be formed in two halves from a pair of channel-section members with outwardly directed flanges which are brought together and united by spot welding. A further example of construction, in which the distance piece is fabricated in that way, is shown in Figure 5. This incorporates an inner frame composed of a pair of sheet metal pressings 18 and 19 of identical shape disposed back to back so that each represents the mirror image of the other. Each of these pressings has a central recess of approximately semi-cylindrical shape which extends between the open ends of the distance piece, so that the respective central recesses combine to form a substantially tubular guide 20 for a centrally placed securing bolt. Along opposite sides of each pressing there is a U-shaped recess 21 which extends parallel to the central recess and is of elongated shape in cross-section. These lateral recesses of the two pressings combine to form what are, in effect, slots extending between a pair of opposite sides of the distance piece. Each of these slots serves as a guide for two securing bolts which lie respectively at opposite extremities of the slot. The distance piece is provided with a pair of attachment lugs 22 arranged as in the other examples previously described. The pressings 18, 19 constituting the inner frame may, if desired, be spot-welded to the body of the distance piece or they may be left unattached.

In addition to the advantages already pointed out, distance pieces constructed and arranged in accordance with this invention possess the further advantage that the attachment of the load-carrying member

to the box-section structural member braces the latter by stabilising a pair of its opposite walls over a substantial area when the securing bolts or rivets are inserted and tightened.

It will be appreciated that the attachment lug or lugs of the distance piece need only be of sufficient area to hold the distance piece in place during subsequent welding or rivetting operations on the structural member, since, when the securing bolts or rivets are assembled in position, the whole arrangement is self-clamping. Further, the distance piece may be provided with only one attachment lug, if desired, instead of two as in the particular examples illustrated, or it may have four of these lugs provided respectively one on each side of one of the open ends of the distance piece.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Means for reinforcing a box-section or other hollow sheet metal structural member assembled from component parts, comprising a distance piece of open-ended box-like form provided at one end with at least one flange-like attachment lug which is spot-welded or rivetted to an internal face of one of the component parts of the structural member before the latter is assembled.

2. A reinforcing device according to Claim 1, wherein the distance piece is provided with means by which bolts or rivets for securing a load-carrying member to the structural member are guided and supported whilst being inserted in place.

3. A reinforcing device according to Claim 2, wherein a sheet metal framework is disposed inside the distance piece and serves for guiding and supporting the said bolts or rivets.

4. A distance piece for reinforcing a hollow sheet metal structural member, constructed and arranged substantially as described with reference to Figures 1 and 2 of the accompanying drawings.

5. A distance piece for reinforcing a hollow sheet metal structural member, constructed and arranged substantially as described with reference to Figure 3 of the accompanying drawings.

6. A distance piece for reinforcing a hollow sheet metal structural member, constructed and arranged substantially as described with reference to Figure 4 of the accompanying drawings.

7. A distance piece for reinforcing a hollow sheet metal structural member, constructed and arranged substantially as described with reference to Figure 5 of the accompanying drawings.

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Dated this 11th day of February, 1948.

For the Applicants.  
A. H. STEED,  
Chartered Patent Agent.

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